QUESTIONNAIRE FOR CHARPY IMPACT MACHINE VERIFICATION

IMPORTANT: This questionnaire contains information to help you perform a successful verification test using SRMs 2092, 2096, or 2098. Energy results are required for verification. Other specific information is requested to help evaluate the condition of your machine. The questionnaire and the fractured specimens must be shipped to: Charpy Program Coordinator, NIST, Division 853, 325 Broadway, Boulder, CO 80305-3328. Phone: 303/497-3351 Fax: 303/497-5939

Location of Machine

Company _____

Address _____

_____

City _____ State Province _____

Country _____ Zip Postal Code _____

Mailing Address for Verification Letter (if different from above)

Company _____

Address _____

_____

City _____ State Province _____

Country _____ Zip Postal Code _____

Test Machine (Circle appropriate units where indicated)

1. Machine Manufacturer _____

2. Machine Serial Number _____

3. What is the maximum energy capacity of the machine? _____
(Joules or ft·lbf)

4. If the machine is adjustable, what capacity was used for this test? _____
(Joules or ft·lbf)

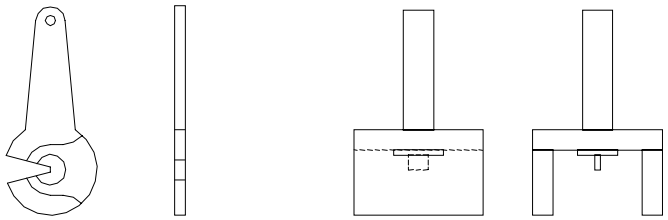
5. Your machine should be securely bolted to a concrete foundation or a steel block having a mass not less than 40 times that of the pendulum. Your machine should be leveled according to the requirements of the current ASTM Standard E23.

6. ASTM Standard E23 does not allow the use of expansion bolts or fasteners with driven in inserts. These types of fasteners will work loose from the foundation and tighten up against the bottom of the machine indicating a false torque value. Only J or T bolts are permitted by the standard. What type of bolts are used to mount your machine? (J, lag, etc.) _____

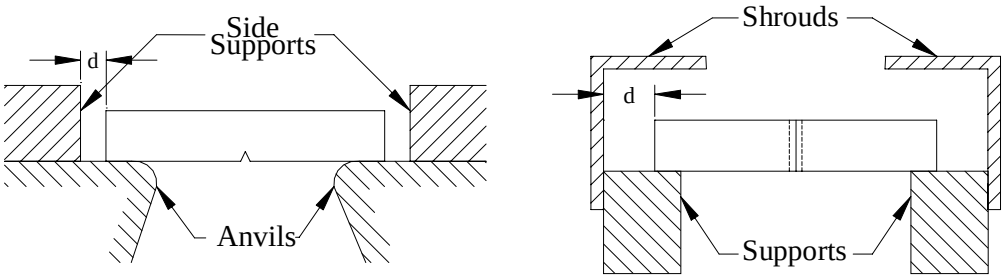
7. Is your machine equipped with a carbide striker and/or anvils? _____

8. Check the appropriate pendulum design below.

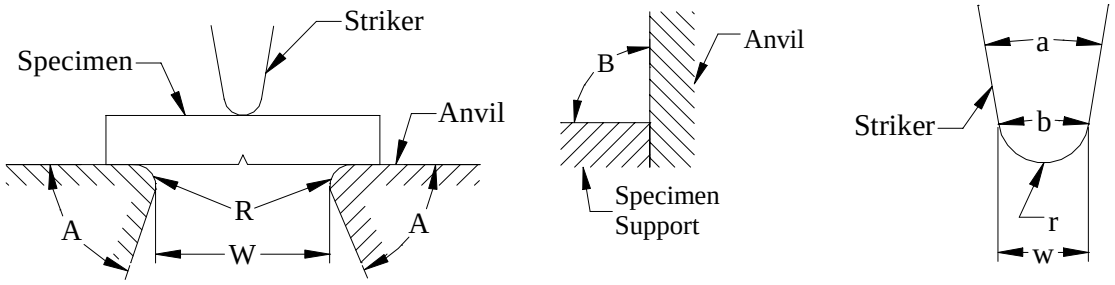
A _____ B_____ C (Other) _____
Please Sketch



9. If side supports or shrouds are used, what is dimension "d"? _____
(mm or in)



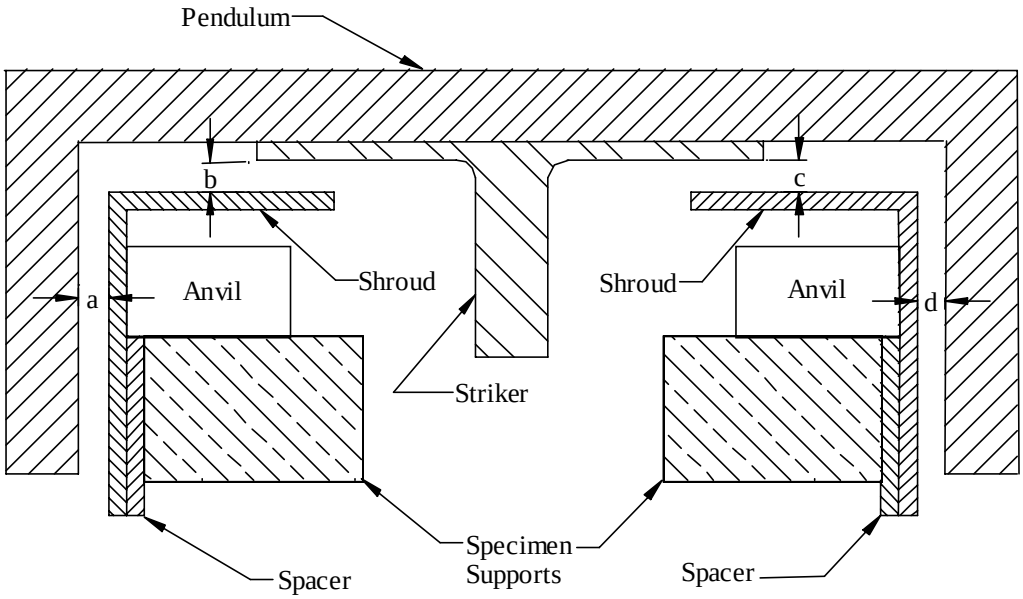
10. Your anvils and striker should conform to the dimensions below:



	Anvils		Striker
A:	80° approx.	a:	30° approx.
R:	1 mm ± 0.05 mm (0.039 in ± 0.002 in)	r:	8 mm ± 0.25 mm (0.315 in ± 0.010 in)
W:	40 mm ± 0.05 mm (1.574 in ± 0.002 in)	w:	4 mm approx. (0.157 in)
B:	90° ± 10 min	b:	0.25 mm (0.010 in)

11. If shrouds are used to contain broken specimens, the following requirements should apply:

(A) The shrouds should have a minimum hardness of 45 HRC.
(B) The thickness of the shrouds should be approximately 1.5 mm (0.06 in).
(C) Dimensions "a, b, c, and d" below should not exceed 1.5 mm (0.06 in).
(D) If dimension "d" in item 9 is more than 13 mm (0.5 in), requirement (C) above does not apply.



12. The striker should pass through the center of the anvils within 0.40 mm (0.016 in).

13. With the pendulum in the free hanging position, engage the energy indicator. The indicator should read within 0.2 % of the maximum energy range being used.

14. What is the friction/windage loss of your machine? _____
(Joules or ft·lbf)

(A) Raise the pendulum to the latched position. Without a specimen in the machine, release the pendulum and permit it to swing 11 half cycles; after the pendulum starts its 11th half cycle, move the pointer to between 5 to 10 % of scale range capacity and record the dial reading. _____(Joules or ft·lbf)
(B) Divide the value by 11, then divide by the maximum scale range of the machine and multiply by 100. The result, friction and windage loss, should not exceed 0.4 %.

15. With the specimen removed from your machine and the pendulum released from its latched position, what is the dial reading after one swing?_____
(Joules or ft·lbf)

This reading should be zero. If this reading is not zero and your machine is equipped with a compensated scale, please adjust the dial to read zero. If your machine is equipped with a non-compensated scale, please compensate the energy values for windage and friction by subtracting the windage and friction value calculated in item 13.

16. When was your machine last verified by the NIST? Date: _____

17. Is your machine equipped with a direct reading scale or a non-compensated scale? _____

IMPORTANT INFORMATION

These procedures must be followed closely to obtain accurate results. The test temperature of NIST reference specimens is near the ductile-brittle transition temperature. Therefore, small differences in temperature and procedure may cause considerable variations in energy values.

- The cooling bath should be placed directly beside the machine. This enables the operator to remove specimens from the bath and fracture them in the machine quickly.

- It is very important that the specimens be removed from the bath and fractured in less than five seconds. Taking longer than five seconds can increase energy values and may cause the low energy specimens to exceed the allowable energy limit.

- If your machine is equipped with a centering device, we do not recommend that you use it to center specimens when performing low temperature testing. Instead, we recommend the use of centering tongs as described in the current ASTM Standard E23. The centering tongs must be cooled with the specimens.

- Verify temperature-measuring equipment at least twice annually. The measurement equipment can be checked immediately before the test by checking a medium with a constant temperature such as dry ice [-78.6 ^{o}C (-109.3 ^{o}F)] or ice water [0.0 ^{o}C (32.0 ^{o}F)].

- When testing super-high energy level specimens or other ductile materials, the anvils should be checked between each test for material left by the previous test.

- When the anvils are replaced it is recommended that practice specimens be broken before NIST specimens are tested.

DETERMINING THE USABLE RANGE OF YOUR MACHINE

You must determine the usable range of your machine. Your machine is considered accurate only within this range. The usable range of your impact machine is dependent upon the resolution of the scale or readout device at the low end and the capacity of the machine at the high end.

The upper limit of the usable range of your machine is equal to 80 % of the capacity of the machine. If your machine is equipped with adjustable ranges, the upper limit of the range in use is equal to 80 % of the capacity of the range.

The resolution of the scale, or readout device, establishes the lower limit of the usable range for the machine. The lower limit is equal to 25 times the resolution of the scale or readout device at 15 J (11 ft·lbf).

On analog scales, the resolution is ½ to ¼ of the difference between two adjacent marks on the scale at 15 J (11 ft·lbf).

The resolution of the digital readout is the smallest change in energy that can be consistently measured at 15 J (11 ft·lbf). Note that a change in the last digit of the display is usually not the resolution. The resolution of your digital readout is available from the manufacturer.

CALCULATE THE LOWER LIMIT OF THE USABLE RANGE OF YOUR MACHINE

If your machine is equipped with a digital readout, what is the resolution? _____

If your machine is equipped with an analog scale, what is the energy value between two adjacent marks on the scale at 15 J (11 ft·lbf)? _____

What is the smallest discernable energy value readable between these marks? (This is normally ½ to ¼ of the difference between two adjacent marks on the scale.) _____

Lower usable limit of your machine. Multiply the above finding by 25. _____
Joules or ft·lbf

YOU SHOULD NOT USE YOUR MACHINE TO PRODUCE DATA BELOW THIS ENERGY VALUE.

Example 1: (Digital Readout)

You have a machine with a capacity of 407 J (300 ft·lbf) and your machine is equipped with a digital readout. The resolution of the readout is 0.14 J (0.1 ft·lbf) at 15 J (11 ft·lbf). The lower limit of your machine is 25 times 0.14 J (0.1 ft·lbf) or 3.5 J (2.6 ft·lbf).

Example 2: (Analog Scale)

You have a machine with a capacity of 407 J (300 ft·lbf) and your machine is equipped with an analog scale. The energy value between the marks at 15 J (11 ft·lbf) is 0.68 J (0.50 ft·lbf). You should be able to estimate to at least 0.34 J (0.25 ft·lbf). This is your resolution. Multiply by 25. The lower limit of your machine is 8.47 J (6.25 ft·lbf).

TESTING TECHNIQUE

1. Test temperature for SRM 2092 low energy and SRM 2096 high energy level specimens must be -40 ºC ± 1 ºC (-40 ºF ± 2 ºF).

2. **IMPORTANT:** Test temperature for SRM 2098 super-high energy level specimens must be 21 ^{o}C ± 1 ^{o}C (70 ^{o}F ± 2 ^{o}F).

3. How long were the specimens held at temperature? (NIST recommends a minimum of 10 minutes) _____

4. What instrument was used to remove the specimens from the bath and center them in the machine? _____

STATE THE REASON FOR VERIFICATION

1. Compliance with annual ASTM Standard E23 Indirect Verification _____

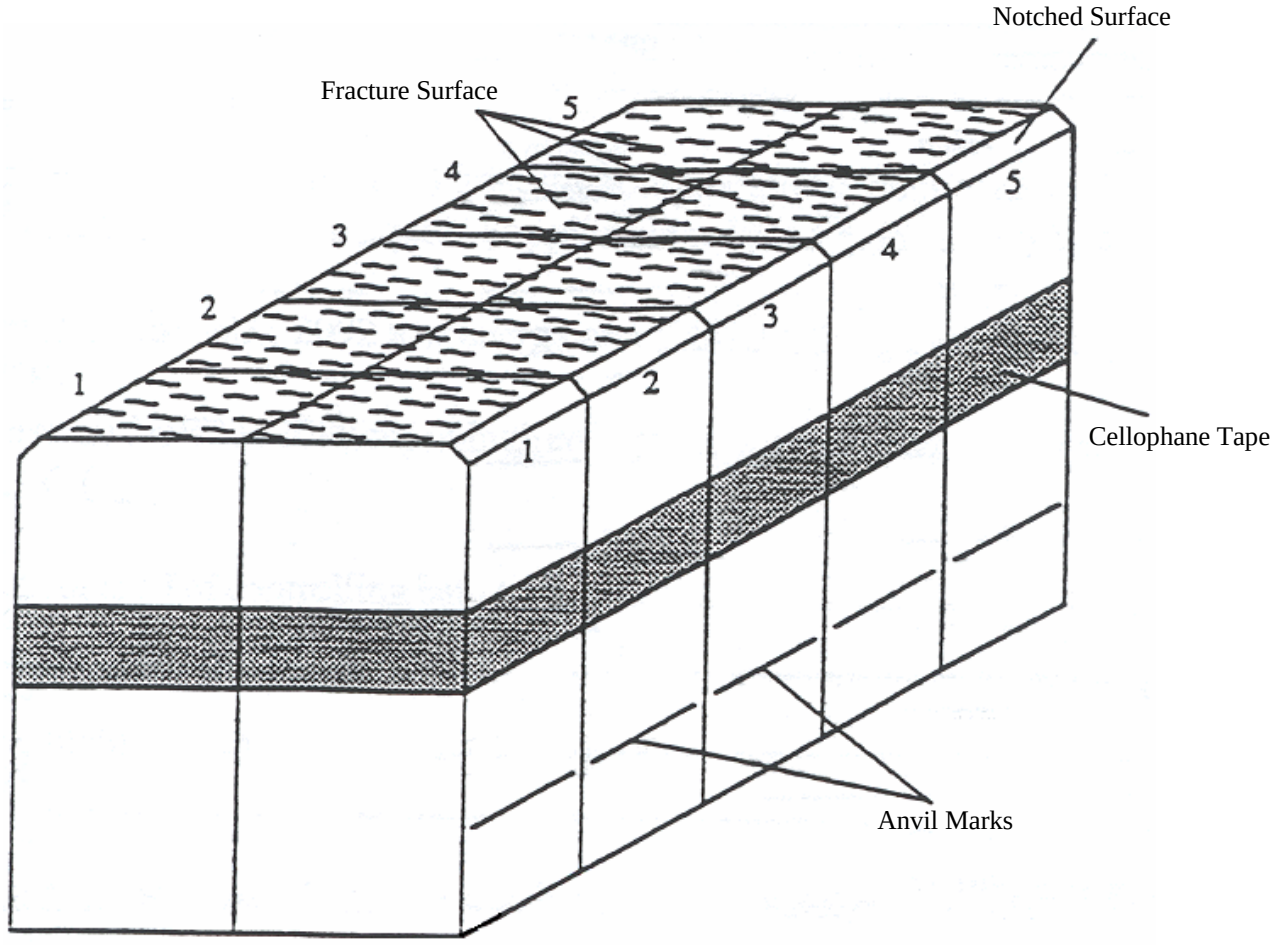
2. Changed striker and/or anvils _____

3. Moved machine _____

4. Changed bearings or pendulum _____

WRAPPING INSTRUCTIONS

To expedite the evaluation of your machine, please secure the 5 broken specimens (10 halves) from a particular energy series, as one unit with **clear cellophane tape** according to the following instructions. See diagram below.



1. Keep broken halves correctly paired (back to back) with the fracture surfaces facing upward and notched surfaces facing outward.

2. Coat the **FRACTURE SURFACES ONLY** with a light coat of oil. **DO NOT** use grease or coat in plastic.

3. Include this completed questionnaire with the fractured specimens.

4. Be sure that you use the **MAILING LABEL** provided with the specimens, and attach the label so that it is clearly displayed on the **OUTSIDE** of the package. This will expedite delivery to the Charpy Coordinator. Customers returning specimens from outside the United States should include the following statement on the U.S. Customs Declaration: **Contents include U.S. manufactured steel test bars being returned to the U.S. for evaluation and are valued at less than 10 U.S. dollars.**

CUSTOMER SERVICE QUESTIONNAIRE

I am pleased with the specimen ordering and shipping process (the process of getting the specimens and the instructions for testing).

	○	○	○	○	○	
	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	

I am pleased with the evaluation process (the process of returning the specimens and data for the comparison to the requirements of the current ASTM Standard E23, and obtaining a verification letter and machine sticker).

	○	○	○	○	○	
	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	

I am pleased with my interactions with the Charpy Coordinator (customer service).

	○	○	○	○	○	
	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	

I am pleased with the quality of the specimens.

	○	○	○	○	○	
	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	

What suggestions do you have for further improvements to the service?

TEST RESULTS

INDICATE ENERGY UNITS (circle units used)

Joules or ft·lbf

Series _____ SRM 2092		**Series _____ SRM 2096**		**Series _____ SRM 2098**	
Specimen Number	**Value**	**Specimen Number**	**Value**	**Specimen Number**	**Value**
Average Value		**Average Value**		**Average Value**	

Date of Test _____
(Month/ Day/ Year)

_____ Telephone _____
PRINT Test Operator

Fax _____

_____ Email _____
SIGNATURE Test Operator

_____ Telephone _____
PRINT Company Representative

Fax _____

_____ Email _____
SIGNATURE Company Representative

If you require approval of your machine by the Defense Contract Management Command (DCMC), a DCMC representative should provide his or her **signature and the DCMC seal** to indicate that the preceding information was witnessed by a government representative.

_____
Print Name of DCMC Official

DCMC Seal

_____
Signature of DCMC Official and Seal

_____
DCMC Office Location